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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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DENNISON, SCHULTZ & MACDONALD
1727 KING STREET
SUITE 105
ALEXANDRIA, VA 22314

EXAMINER	
WHITTINGTON, KENNETH	

ART UNIT	PAPER NUMBER
2862	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/781,813	IKEDA ET AL.	
	Examiner	Art Unit	
	Kenneth J. Whittington	2862	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13,15-24 and 27-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,15-24 and 27-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The Amendment and Remarks thereto filed August 1, 2007 has been entered and considered. In view thereof, the 112 rejections of claims 25-26 have been withdrawn.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamaoka et al. (US6483296), hereinafter Hamaoka II, in view of Ooki et al. (US 2002/0121894), hereinafter Ooki.

Regarding claim 1, Hamaoka II teaches a rotary position sensor comprising:

a magnet support having an inner and outer surface (See Hamaoka II FIGS. 18-24, items 24 and 29);

at least two magnets attached to the magnet support symmetrically arranged about the center of rotation, so that the magnets produce a uniform magnetic field across a center of rotation, wherein the magnets have opposite end portions in a circumferential direction about the center of rotation, and wherein the magnets are spaced from each other in the circumferential direction by gaps, further wherein there is no

magnetic material along an inner peripheral surface of the at least two magnets, and the at least two magnets are not continuous in a circumferential direction (See FIGS. 18-24, items 145 and 146);

a magnetoresistive sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and sensor rotate relative to each other (See FIGS. 18-24, items 31 and col. 17, lines 15-18);

wherein the magnetoresistive sensor outputs signals representing a relative rotational angle (See FIGS. 18-24 and see col. 15, line 30 to col. 16, line 57).

However, Hamaoka II does not specifically disclose the material for the magnets. Ooki teaches using ferrite-based magnets in rotary position sensors wherein the magnets are located on opposite sides of the sensor and rotate with respect thereto (See Ooki FIGS. 1-3, items 4 and 5 and see paragraph 0030). It would have been obvious at the time the invention was made to use ferrite magnets in the sensor assembly of Hamaoka II. One having ordinary skill in the art would have been motivated to do so to provide an economical magnet assembly and reduce the cost of the sensor assembly (See Ooki paragraph 0030).

Regarding claim 2, the noted combination teaches the at least two magnets are disposed substantially symmetrically with respect to the center of rotation (See Hamaoka II FIGS. 18-24, items 39).

Regarding claim 3, the noted combination teaches the sensor is positioned substantially at the center of rotation (See Hamaoka II FIGS. 18-24, item 31).

Regarding claim 4, the noted combination teaches the magnet support comprises a substantially tubular member, and the at least two magnets are attached to an inner peripheral surface of the tubular member, and the substantially tubular member has a central axis along the center of rotation (See Hamaoka II FIGS. 18-24, items 24, 29, 145, 146).

Regarding claim 5, the noted combination teaches the magnets are magnetized to produce a substantially uniform magnetic field that intersects the sensor, and wherein the substantially uniform magnetic field can be represented by substantially parallel, unidirectional, magnetic field lines intersecting the sensor (See Hamaoka II FIGS. 18-24).

Regarding claim 6, 7, 8, 9 and 10, the noted combination teaches each of the magnets has an arc-shaped configuration along a circumferential direction of the tubular member, the magnets have a uniform thickness in the radial direction of the

tubular member, have opposite ends along the circumferential direction, the end surfaces on the inner side of the tubular member, and the end surfaces comprises a first surface and a second surface that are respectively substantially aligned with a direction of the magnetic field and substantially aligned perpendicular to the direction of the magnetic field (See Hamaoka II FIGS. 18-24, items 145 and 146).

Regarding claim 15, the noted combination teaches the Hall IC in the embodiments can be exchanged with a magneto resistance element (See Hamaoka II col. 17, lines 10-22).

Claims 1-9, 11, 12, 16, 17, 19-22 and 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (US5544000), hereinafter Suzuki, in view of Schroeder et al. (US6614223), hereinafter Schroeder.

Regarding claims 1, 16, 20, 27, 28, 30 and 31, Suzuki teaches a rotation angle sensor comprising:

a magnet support having an inner surface that is radial and an outer surface (See Suzuki FIGS. 1-3, 9, 13, 14, item 4);

at least two magnets attached to the inner surface of the magnet support, so that the magnets produce a magnetic field across a center or rotation, wherein the magnets are made of ferrite-based magnetic materials and have opposite end portions

in a circumferential direction about the center of rotation, and wherein the magnets are spaced from each other in the circumferential direction by gaps, further wherein there is no magnetic material along an inner peripheral surface of the at least two magnets, there is no magnetic material between the poles or inner peripheral surfaces of the magnets in a diametrical direction, and the at least two magnets are not continuous with each other in a circumferential direction, and there is no magnetic material around the sensor and within at least one of the gaps (See FIGS. 1-3, 9, 13, 14, magnets 2a-2b about sensor 8a-8b);

a sensor disposed within the magnetic field and arranged and constructed to detect a change of direction of the magnetic field as the magnets and sensor rotate relative to each other (See FIGS. 1-3, 9, 13, 14, sensor 8a-8b);

wherein the sensor outputs signals representing a relative rotational angle (See col. 5, line 34 to col. 8, line 2), and

wherein a control unit for receiving the output signals and calculating a linear angle output (See FIG. 11, note circuit for receiving signals and note linear output shown in FIG. 12).

However, Suzuki does not explicitly teach the use of a magnetoresistive sensor. Schroeder teaches the use of either Hall or magnetoresistive sensors for use in a rotary position

sensor having a pair of magnets rotating about such magnetic sensors (See Schroeder col. 3, lines 53-65). It would have been obvious at the time the invention was made to use the magnetoresistive sensors in lieu of the Hall sensors in the apparatus of Suzuki. One having ordinary skill in the art would do so because such sensors are interchangeable in such sensing systems for measuring a magnetic field (See Schroeder col. 3, lines 53-65 and col. 1, line 38 to col. 2, line 3).

Regarding claims 2, 3 and 17, the noted combination teaches the magnets disposed substantially symmetrically about the center of rotation and the sensors positioned at substantially the center of rotation (See Suzuki FIGS. 1-3, 9, 13, 14, magnets 2a-2b and sensor 8a-8b).

Regarding claim 4, the noted combination teaches the magnet support comprises a substantially tubular member, and the at least two magnets are attached to an inner peripheral surface of the tubular member, and the substantially tubular member has a central axis along the center of rotation (See Suzuki FIGS. 1-3, 9, 13, 14, magnets 2a-2b and support 4).

Regarding claim 5, the noted combination teaches the magnets are magnetized to produce a substantially uniform magnetic field that intersects the sensor, and wherein the substantially uniform magnetic field can be represented by

substantially parallel, unidirectional, magnetic field lines intersecting the sensor (See Suzuki FIGS. 1-3, 8, 9, 13, 14, magnets 2a-2b).

Regarding claim 6, 7, 8, 9 and 29, the noted combination teaches each of the magnets has an arc-shaped configuration along a circumferential direction of the tubular member, the magnets have a uniform thickness in the radial direction of the tubular member, have opposite ends along the circumferential direction, the end surfaces on the inner side of the tubular member (See Suzuki FIGS. 1-3, 8, 9, 13, 14, magnets 2a-2b).

Regarding claims 11 and 12, the noted combination teaches the magnets extend along an angle measured about the center of rotation, determined such that an error is less than a predetermined value, wherein the angle is determined based on factors comprising offset tolerance of the sensor from center of rotation, magnetic material and thickness of the magnets (See Suzuki col. 8, lines 17-42, note that the factors would be considered for determinations regarding offset tolerances).

Regarding claim 19, the noted combination teaches the opposing ends of the magnets are substantially orthogonal to an outer circumferential surface of each of the magnets (See Suzuki FIGS. 1-3, 8, 9, 13, 14, magnets 2a-2b).

Regarding claims 21 and 22, the noted combination teaches the end portions of the magnets having predetermined configurations based on a central angle about the center of rotation between ends of the magnets (See Suzuki FIGS. 1-3, 8, 9, 13, 14, magnets 2a-2b).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Schroeder as discussed above with respect to claim 1, and further in view of ordinary skill in the art. Regarding this claim, it is noted that Suzuki is concerned with making a uniform field between the magnets so that if the sensor at a specific offset from the center of rotation, it will still be in the uniform field and the errors associated therewith will be compensated (See Suzuki at least at col. 8, lines 17-42). However, Suzuki does not disclose any particular offset distance. Nonetheless, it would have been obvious at the time the invention was made to use the recited dimension for the offset because where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *See* MPEP 2144.05II(A). Furthermore, modifying the noted combination such the maximum offset has the relative dimensions recited in the claim would be obvious to one having

ordinary skill in the art through routine experimentation because where the where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *See Gardner v. TEC Systems*, Inc., 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 225 USPQ 232 (1984). One having ordinary skill to modify the noted combination as noted above would be motivated to do so to allow for off center placement of the sensor while still maintaining accurate rotational measurements, the offset being determined based on the needed requirements or tolerances of the sensor assembly.

Claims 18, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view Schroeder as discussed above, and further in view of Hamaoka II.

Regarding claims 18, 23 and 24, the noted combination teaches the features of claims 16, 17 and 21 as noted above, except for the end portions as recited in these claims. Hamaoka II teaches each end of the magnet having a surface that is substantially perpendicular to the direction of the magnetic field and a surface that is substantially parallel to the

magnetic field across a center of rotation, such that the surface are inclined to the inner and outer surfaces of the magnets by obtuse angles (See Hamaoka II FIGS. 18-24, note particularly FIGS. 21A-21C). It would have been obvious at the time the invention was made to incorporate the magnets with the recited ends as taught by Hamaoka II in the sensor apparatus of Suzuki in view of Schroeder. One having ordinary skill in the art would have been motivated to do because magnets of these shapes and magnetizations increase the angular range of the sensor (See Hamaoka II col. 15, line 32 to col. 16, line 57).

Response to Arguments

Applicant's arguments filed August 1, 2007 have been fully considered but they are not persuasive.

Applicants' first argument is that the Suzuki does not disclose the use of a magnetoresistive sensor and a ferrite based magnet. However, as noted in Suzuki, the magnets are made of Nd-Fe-B, which includes Fe or iron. Thus, the magnets are ferrite based. Secondly, Schroeder teaches a modification of Suzuki to use either a Hall or magnetoresistive sensor in a magnetic rotary position sensor.

Applicants' second argument is that it is not common in the art to use ferrite and magnetoresistive sensors. However,

Schroeder precisely discloses this. Schroeder's apparatus uses either Hall or magnetoresistive sensors in conjunction with magnets that are ferrite based (See Schroeder FIGS. 3-5 and col. 3, lines 47-53 and col. 4, lines 45-65). Thus, using such sensors and materials is known in the art, contrary to Applicants' assertions.

Applicants' final argument is that the prior art does not teach a controller. However, as noted above in the rejections, Suzuki teaches such a feature as noted.

Conclusion

Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Whittington whose telephone number is (571) 272-2264. The examiner can normally be reached on Monday-Friday, 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on (571) 272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Kenneth J Whittington
Examiner
Art Unit 2862

kjw

REENA AURORA
PRIMARY EXAMINER
TECHNOLOGY CENTER 2800